Claims

1. A device for cleaving an optical fibre, comprising a fixing mechanism to fix a fixing element to the optical fibre, and a cleaving mechanism to cleave the optical fibre.

2. A device according to claim 1, in which the fixing element comprises a ferrule.

3. A device according to claim 1 or claim 2, in which the fixing element is fixed to the optical fibre such that the fibre extends through the fixing element.

4. A device according to any preceding claim, comprising a hand-held tool.

5. A device according to any preceding claim, in which the cleaving mechanism of the device cleaves the fibre when the fixing element has been fixed thereto.

6. A device according to claim 5, in which the cleaving mechanism of the device is able to cleave the fibre only when the fixing element has been fixed thereto.

7. A device according to any preceding claim, in which the fixing mechanism and the cleaving mechanism are arranged such that the fibre is cleaved, and consequently an end face of the fibre is produced, at a preset position along the fibre with respect to the fixing element.

8. A device according to any preceding claim, in which the fixing mechanism is a crimping mechanism to crimp the fixing element and thereby fix it to the fibre.

9. A device according to any preceding claim, in which the cleaving mechanism cleaves the fibre such that the end face produced is oriented at a non-perpendicular angle with respect to a longitudinal axis of the fibre.

10. A device according to claim 9, in which the fixing mechanism and the cleaving mechanism are mutually arranged such that the fibre end face produced by the cleaving mechanism is at a preset orientation with respect to the fixing element.

11. A device according to claim 10, in which the fixing mechanism includes orientation determining means arranged to orient the fixing element at a predetermined orientation about the longitudinal axis of the fibre, with respect to the cleaving mechanism.

12. A device according to claim 11, in which the orientation determining means comprises a non-circular orifice arranged to receive therein a said fixing element having a corresponding non-circular cross-section.

13. A device according to claim 12, including first closing means that closes the non-circular orifice when the device is not in operation.

14. A device according to any preceding claim, including an aperture by which a separated end portion of the cleaved optical fibre may be removed from the device.

15. A device according to claim 14, including second closing means that closes the aperture when the device is not in operation.

16. A device according to any preceding claim, in which the fixing mechanism grips the fixing element while the cleaving mechanism cleaves the fibre.

17. A device according to any preceding claim, in which the cleaving mechanism includes a clamping mechanism that grips the fibre while the fibre is cleaved.

18. A device according to claim 17, in which the clamping mechanism comprises a pair of tapes between which the fibre is gripped, the tapes being arranged such that for each fibre, or set of fibres, that is/are cleaved by the device a different position along the tapes is used to grip the fibre.

19. A device according to any preceding claim, in which the fibre is placed under tension and/or shear by the cleaving mechanism while the fibre is cleaved.

20. A device according to any preceding claim, in which the cleaving mechanism includes an anvil that causes the fibre to be bent while the fibre is cleaved.

21. A device according to any preceding claim, in which the cleaving mechanism includes a scoring blade arranged to score the fibre, causing a crack to propagate through the fibre, thereby cleaving the fibre.

22. A device according to claim 21, in which the scoring blade is arranged such that for each fibre, or set of fibres that is/are cleaved by the device, a different position on the blade is used to score the fibre.

23. A device according to any preceding claim, including a lifetime indicator that indicates the number of cleaves that have been made by the device since a device set-up procedure and/or the number of cleaves remaining for the device, preferably until a device re-set procedure.

24. A device according to any preceding claim, which is arranged to cleave a plurality of optical fibres substantially simultaneously.

25. A device according to claim 24, in which the fixing mechanism is arranged to fix one or more said fixing elements to said plurality of optical fibres, preferably substantially simultaneously.

26. A device according to claim 24 or claim 25, in which the plurality of optical fibres comprise ribbon fibre.

27. A device substantially as described herein with reference to the accompanying drawings.

28. A device according to any preceding claim having attached thereto a flexibly-positionable neck and clamp for temporarily attaching the device in a convenient working position on a telecoms distribution frame or other apparatus where optical fibres are to be connected.

29. A device according to any preceding claim, wherein a connector body holder (ASAH) is attached to the device to hold a connector body (ASA) into which (when present) will be inserted a crimped ferrule and cleaved optical fibre prepared by use of the device.

30. A device according to claim 29, wherein the connector body holder (ASAH) is rotatably attached to the device to enable insertion of a ferrule and fibre into each end of the connector body (ASA), when present, from directions of insertion less than 180 degrees apart, preferebly less than 90 degrees apart, more preferably from substantially the same direction of insertion.

31. A device according to claim 29 or 30, having attached thereto a ferrule assembly holder (CKAH) for holding the assembly (CKA) of (i) ferrule and (ii) fibre to be cleaved and (iii) a ferrule holder, which CKAH is adapted to hold the CKA during the crimp and cleave operation.

32. A device according to claim 31, having guide means attached thereto, whereby the CKAH is moveable on a controlled path from the crimp-and-cleave position to bring the CKA into alignment with an ASA when held in the ASAH in use, and the CKAH is then releaseable to enable insertion and locking of the CKA into the ASA.

33. A device according to claim 31 or 32, wherein the CKAH carries a re-useable resiliently-compressible member for insertion into a succession of suitably shaped and arranged CKAs, between the end of the ferrule and the facing internal end of the ferrule holder, to compensate resiliently for cleaved fibre length tolerance variations during insertion of the CKAs into ASAs held in the ASAH in use, and the said compressible member is removable from the CKAs after insertion and locking of the CKAs into the ASAs.

34. A device according to claim 33, wherein the said compressible member is attached to the CKAH by a flexible member of sufficient length and flexibility to permit release of the CKA from the CKAH and insertion and locking of the CKA into the ASA held in the ASAH in use, while the compressible member is in place in the CKA.

35. A device according to claim 34, wherein retraction means are provided for retracting the flexible member after removal of the said compressible member from the CKA,

thereby to re-position the compressible member on the CKAH ready for insertion into the next CKA.

36. A device according to claim 29 or 30 having attached thereto securing means for directly securing the ferrule and the fibre during and after the crimp and cleave operation in the absence of any separate ferrule holder.

37. A device according to claim 36 having transfer means attached thereto whereby the securing means and the secured crimped ferrule and cleaved fibre can be moved, preferably guided by guide means attached to the device, (i) to bring the ferrule and fibre from the crimp-and-cleave position into alignment with an ASA when held in the ASAH in use and (ii) to insert the ferrule and fibre into the ASA in the required orientation with or without a keying formation on the ferrule, the securing means being releasable after the ferrule has been fixed in the ASA in the required orientation.

38. A method of coupling optical fibres using a device according to claim 32, the method including at least the Steps 1 to 10 hereinbefore described.

39. A method of coupling optical fibres using a device according to claim 37, including the steps of (a) directly securing a ferrule and a fibre in the said securing means during and after the crimp and cleave operation in the absence of any separate ferrule holder, (b) moving the secured crimped ferrule and cleaved fibre (i) to bring the ferrule and fibre from the crimp-and-cleave position into alignment with an ASA when held in the ASAH in use and (ii) to insert the ferrule and fibre into the ASA in the required orientation with or without a keying formation on the ferrule, (c) fixing the ferrule and fibre in the ASA in the required orientation, and (d) releasing the securing means.

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AMENDED CLAIMS

[Received by the International Bureau on 05 January 2004 (05.01.04): original claim 18 deleted; remaining claims 19-39 renumbered; (5 pages)]

1. A device for cleaving an optical fibre, comprising a fixing mechanism to fix a fixing element to the optical fibre, and a cleaving mechanism to cleave the optical fibre.

2. A device according to claim 1, in which the fixing element comprises a ferrule.

3. A device according to claim 1 or claim 2, in which the fixing element is fixed to the optical fibre such that the fibre extends through the fixing element.

4. A device according to any preceding claim, comprising a hand-held tool.

5. A device according to any preceding claim, in which the cleaving mechanism of the device cleaves the fibre when the fixing element has been fixed thereto.

6. A device according to claim 5, in which the cleaving mechanism of the device is able to cleave the fibre only when the fixing element has been fixed thereto.

7. A device according to any preceding claim, in which the fixing mechanism and the cleaving mechanism are arranged such that the fibre is cleaved, and consequently an end face of the fibre is produced, at a preset position along the fibre with respect to the fixing element.

8. A device according to any preceding claim, in which the fixing mechanism is a crimping mechanism to crimp the fixing element and thereby fix it to the fibre.

9. A device according to any preceding claim, in which the cleaving mechanism cleaves the fibre such that the end face produced is oriented at a non-perpendicular angle with respect to a longitudinal axis of the fibre.

10. A device according to claim 9, in which the fixing mechanism and the cleaving mechanism are mutually arranged such that the fibre end face produced by the cleaving mechanism is at a preset orientation with respect to the fixing element.

11. A device according to claim 10, in which the fixing mechanism includes orientation determining means arranged to orient the fixing element at a predetermined orientation about the longitudinal axis of the fibre, with respect to the cleaving mechanism.

12. A device according to claim 11, in which the orientation determining means comprises a non-circular orifice arranged to receive therein a said fixing element having a corresponding non-circular cross-section.

13. A device according to claim 12, including first closing means that closes the non-circular orifice when the device is not in operation.

14. A device according to any preceding claim, including an aperture by which a separated end portion of the cleaved optical fibre may be removed from the device.

15. A device according to claim 14, including second closing means that closes the aperture when the device is not in operation.

16. A device according to any preceding claim, in which the fixing mechanism grips the fixing element while the cleaving mechanism cleaves the fibre.

17. A device according to any preceding claim, in which the cleaving mechanism includes a clamping mechanism that grips the fibre while the fibre is cleaved.

18. A device according to any preceding claim, in which the fibre is placed under tension and/or shear by the cleaving mechanism while the fibre is cleaved.

19. A device according to any preceding claim, in which the cleaving mechanism includes an anvil that causes the fibre to be bent while the fibre is cleaved.

20. A device according to any preceding claim, in which the cleaving mechanism includes a scoring blade arranged to score the fibre, causing a crack to propagate through the fibre, thereby cleaving the fibre.

21. A device according to claim 21, in which the scoring blade is arranged such that for each fibre, or set of fibres that is/are cleaved by the device, a different position on the blade is used to score the fibre.

22. A device according to any preceding claim, including a lifetime indicator that indicates the number of cleaves that have been made by the device since a device set-up procedure and/or the number of cleaves remaining for the device, preferably until a device re-set procedure.

23. A device according to any preceding claim, which is arranged to cleave a plurality of optical fibres substantially simultaneously.

24. A device according to claim 24, in which the fixing mechanism is arranged to fix one or more said fixing elements to said plurality of optical fibres, preferably substantially simultaneously.

25. A device according to claim 24 or claim 25, in which the plurality of optical fibres comprise ribbon fibre.

26. A device substantially as described herein with reference to the accompanying drawings.

27. A device according to any preceding claim having attached thereto a flexibly-positionable neck and clamp for temporarily attaching the device in a convenient working position on a telecoms distribution frame or other apparatus where optical fibres are to be connected.

28. A device according to any preceding claim, wherein a connector body holder (ASAH) is attached to the device to hold a connector body (ASA) into which (when present) will be inserted a crimped ferrule and cleaved optical fibre prepared by use of the device.

29. A device according to claim 28, wherein the connector body holder (ASAH) is rotatably attached to the device to enable insertion of a ferrule and fibre into each end of the connector body (ASA), when present, from directions of insertion less than 180 degrees apart,

preferebly less than 90 degrees apart, more preferably from substantially the same direction of insertion.

30. A device according to claim 28 or 29, having attached thereto a ferrule assembly holder (CKAH) for holding the assembly (CKA) of (i) ferrule and (ii) fibre to be cleaved and (iii) a ferrule holder, which CKAH is adapted to hold the CKA during the crimp and cleave operation.

31. A device according to claim 30, having guide means attached thereto, whereby the CKAH is moveable on a controlled path from the crimp-and-cleave position to bring the CKA into alignment with an ASA when held in the ASAH in use, and the CKAH is then releaseable to enable insertion and locking of the CKA into the ASA.

32. A device according to claim 30 or 31, wherein the CKAH carries a re-useable resiliently-compressible member for insertion into a succession of suitably shaped and arranged CKAs, between the end of the ferrule and the facing internal end of the ferrule holder, to compensate resiliently for cleaved fibre length tolerance variations during insertion of the CKAs into ASAs held in the ASAH in use, and the said compressible member is removable from the CKAs after insertion and locking of the CKAs into the ASAs.

33. A device according to claim 32, wherein the said compressible member is attached to the CKAH by a flexible member of sufficient length and flexibility to permit release of the CKA from the CKAH and insertion and locking of the CKA into the ASA held in the ASAH in use, while the compressible member is in place in the CKA.

34. A device according to claim 33, wherein retraction means are provided for retracting the flexible member after removal of the said compressible member from the CKA, thereby to re-position the compressible member on the CKAH ready for insertion into the next CKA.

35. A device according to claim 28 or 29 having attached thereto securing means for directly securing the ferrule and the fibre during and after the crimp and cleave operation in the absence of any separate ferrule holder.

36. A device according to claim 35 having transfer means attached thereto whereby the securing means and the secured crimped ferrule and cleaved fibre can be moved, preferably guided by guide means attached to the device, (i) to bring the ferrule and fibre from the crimp-and-cleave position into alignment with an ASA when held in the ASAH in use and (ii) to insert the ferrule and fibre into the ASA in the required orientation with or without a keying formation on the ferrule, the securing means being releasable after the ferrule has been fixed in the ASA in the required orientation.

37. A method of coupling optical fibres using a device according to claim 31, the method including at least the Steps 1 to 10 bereinbefore described.

38. A method of coupling optical fibres using a device according to claim 36, including the steps of (a) directly securing a ferrule and a fibre in the said securing means during and after the crimp and cleave operation in the absence of any separate ferrule holder, (b) moving the secured crimped ferrule and cleaved fibre (i) to bring the ferrule and fibre from the crimp-and-cleave position into alignment with an ASA when held in the ASAH in use and (ii) to insert the ferrule and fibre into the ASA in the required orientation with or without a keying formation on the ferrule, (c) fixing the ferrule and fibre in the ASA in the required orientation, and (d) releasing the securing means.

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